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Animal Keepers' Forum

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MISSION STATEMENT

American Association of Zoo Keepers, Inc.

The American Association of Zoo Keepers, Inc. exists to advance excellence in the animal keeping profession, foster effective communication beneficial to animal care, support deserving conservation projects, and promote the preservation of our natural resources and animal life.

ABOUT THE COVER

This month's cover photo comes to us from Shauna Dankberg of Zoo Atlanta. The photo features "Yang Yang" the giant panda (*Ailuropoda melanoleuca*). He is 20-years-old and has lived at Zoo Atlanta since 1999 when he was two-years-old. He has been described by admirers as a perpetual cub because of his playful antics. He is pretty social and engages in play with his keepers. He plays tug-of-war, and usually wins, and he is quite the training star. When the mood strikes him, he will run around his exhibit carrying and throwing around his enrichment toys.

With just over 1800 wild individuals, giant pandas were recently delisted and are now considered Vulnerable by the IUCN. They are native to China and are found in a few fragmented populations in the mountains. They eat almost exclusively bamboo but will also consume some other plant material and have even been known to eat carrion. They are the second smallest species of bear and are easily recognized by their distinct black and white coloration.

This photo was a runner-up for AAZK's 50th Anniversary Golden Animal Photo Contest. The contest featured animals that were either golden in color, or older animals that were charismatic favorites of zoo visitors. Thank you to all of the photographers who joined the AAZK membership in celebrating our 50th anniversary, and for sharing your stories about some very incredible "golden animals".

Articles sent to ***Animal Keepers' Forum*** will be reviewed by the editorial staff for publication. Articles of a research or technical nature will be submitted to one or more of the zoo professionals who serve as referees for ***AKF***. No commitment is made to the author, but an effort will be made to publish articles as soon as possible. Lengthy articles may be separated into monthly installments at the discretion of the Editor. The Editor reserves the right to edit material without consultation unless approval is requested in writing by the author. Materials submitted will not be returned unless accompanied by a stamped, self-addressed, appropriately-sized envelope. Telephone, fax or e-mail contributions of late-breaking news or last-minute insertions are accepted as space allows. Phone (330) 483-1104; FAX (330) 483-1444; e-mail is shane.good@aazk.org. If you have questions about submission guidelines, please contact the Editor. Submission guidelines are also found at: aazk.org/akf-submission-guidelines/.

Deadline for each regular issue is the 3rd of the preceding month. Dedicated issues may have separate deadline dates and will be noted by the Editor.

Articles printed do not necessarily reflect the opinions of the ***AKF*** staff or the American Association of Zoo Keepers, Inc. Publication does not indicate endorsement by the Association.

MEMBERSHIP SERVICES

Animal Data Transfer Forms available for download at aazk.org. AAZK Publications/Logo Products/Apparel available at AAZK Administrative Office or at aazk.org.

ANIMAL KEEPERS' FORUM

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FROM THE PRESIDENT

"In order for AAZK to continue to be a successful organization we need all of the members to play an active role."

Transitions: At the conclusion of the AAZK National Conference hosted by the National Capitol Chapter in Washington DC, your new Executive Board was announced and four new Board members were sworn in as Directors. Thus the AAZK Board has grown from five to seven members, fulfilling a decision made during the Annual Meeting in Memphis in 2016. This growth has allowed us to restructure some responsibilities within the Board and set a framework for improved communication and collaboration between AAZK Committees as well as with you, the members of the Association.

Collaborations: The members of the AAZK Board and the AAZK, Inc. staff are here to provide the conduit for the membership to be able to grow professionally, network effectively, and be a source for conservation both locally and globally.

In the coming year, I would like to change the format of the President's Message in the *Animal Keeper's Forum* and allow you to become familiar with the team aspect that AAZK has to offer. I will be asking the Board of Directors and AAZK staff to introduce themselves to you and share what their teams are working on and working towards.

In order for AAZK to continue to be a successful organization we need all of the members to play an active role. As you read the descriptions below of the various teams and committees within AAZK, I encourage you to think about where your passion lies and consider where you may be able to make a contribution.

Introductions: Ed Hansen is your CEO/CFO and coordinates the membership database and Chapter recharter process, manages the AAZK website, and upholds the financial management for the Association. Shane Good and Elizabeth Thibodeaux work together to produce your monthly magazine, the *Animal Keepers' Forum*, which keeps you linked to the AAZK Conservation Partners, AAZK Commercial Members, and the most up to date information your colleagues are sharing.

As President and member of the Executive Board, my role is to maintain AAZK Board management and offer an open dialogue with the AAZK Chapters and members of the Association. I will mentor the Board Oversights and teams under Education and Communication. I will also remain in the role of Conference Manager, a position I feel is so important for facilitating the development and progress of the AAZK National Conference as we move forward with selecting the Conference hosts four years in advance. Additionally, as part of a collaborative effort, I will represent AAZK as a Steering Committee member with the International Congress of Zookeepers (ICZ).

Mary Ann Cisneros is your new Vice President and second member of the Executive Board. In this role she will mentor the Board Oversights and teams under Conservation, Recognition and Regulation. In this role she is also responsible for convening an Ethics Committee should a situation arise where this is called for. Additionally she will be the direct report for the AAZK Bylaws Manager. Mary Ann will also represent AAZK as a liaison to our partner organizations.

Bill Steele has switched leadership roles and will now be the Board Oversight for Recognition, comprised of the AAZK Awards Committee and the AAZK Grants Committee.

Lee Hart will be the Board Oversight for Education, comprised of the AAZK Professional Development Committee and the AAZK International Outreach Committee.

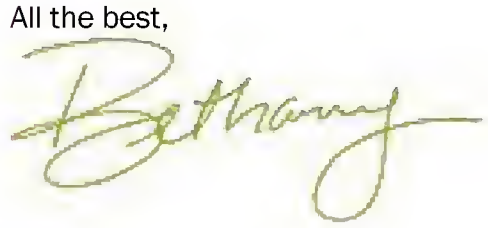
Azzara Oston will be the Board Oversight for Conservation, a team made up of the AAZK Conservation Committee, the AAZK Trees for You and Me Program, and the AAZK Bowling for Rhinos Program.

Hardy Kern will be the Board Oversight for Communication, a team which will now encompass the AAZK Communication Committee, the AAZK Resource Committee and the National Zoo Keeper Week Program.

Paul Brandenburger will be the Board Oversight for Regulation, comprised of the AAZK Safety Committee and the AAZK Behavioral Husbandry Committee.

This is your Association and we are all part of one large team of animal care professionals working toward common goals. I encourage you to reach out to the Board and the Committees if you have questions, comments, or if you would like to become more involved. Stay engaged by visiting the AAZK website and following AAZK on Facebook, on Twitter, and at our You Tube channel. We look forward to hearing from you.

All the best,



Bethany
Bethany.Bingham@aazk.org

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COMING EVENTS

Post upcoming events here!
e-mail shane.good@aazk.org

November 4-8, 2017
ZAA 12th Annual Conference
San Antonio, TX
Hosted by San Antonio Zoo
For more information go to:
zaa.org/conference/annual-conference

November 8-9, 2017
Fruit Bat Husbandry Course
Gainesville, FL
Hosted by Lubee Bat Conservancy
For more information go to:
lubee.org/events/husbandrycourse/

January 22-26, 2018
Zoos and Aquariums Committing to Conservation
Jacksonville, FL
Hosted by Jacksonville Zoo
For more information go to:
zaccconference.com/

March 24-29, 2018
AZA Mid-Year Meeting
Jacksonville, FL
Hosted by Jacksonville Zoo and Gardens
For more information go to:
aza.org/conferences-meetings#mym

April 8-13, 2018
Animal Behavior Management Alliance (ABMA) Annual Conference
San Antonio, TX
Hosted by San Antonio Zoo and Sea World San Antonio
For more information go to:
theabma.org/abma-annual-conference/

April 10 or 11, 2018
(*same workshop held each day)
Ape Cardio Health Workshop
Waco, TX
Hosted by Cameron Park Zoo
For more information contact:
orangutan@wacotx.gov

April 29 - May 1, 2018
Recon: Reconnecting with Elephants in Protected Contact
Colorado Springs, CO
Hosted by Cheyenne Mountain Zoo
For more information go to:
cmzoo.org/index.php/recon-elephant-workshop/

September 23-27, 2018
AZA Annual Conference
Seattle, WA
Hosted by Seattle Aquarium and Woodland Park Zoo
For more information go to:
aza.org/conferences-meetings#mym

October 14-18, 2018
International Congress on Zookeeping
Buenos Aires, Argentina
Hosted by Fundacion Temaiken and the International Congress of Zookeepers
For more information go to:
iczoo.org/congress

AMERICAN ASSOCIATION of ZOO KEEPERS

October 4-8, 2018
AAZK National Conference
Denver, CO

Hosted by the Rocky Mountain AAZK Chapter and Denver Zoo

rmaazk.org/2018-national-aazk-conference/

October 15-20, 2018
Otter Keeper Workshop
Portland, OR
Hosted by Oregon Zoo
For more information go to:
otterkeeperworkshop.org/

Photo by Eric Peterson, Utah's Hogle Zoo

Dedicated Issue on Waterfowl Coming in December!

The December issue of the AKF will be a double issue dedicated to waterfowl. There will be **no November issue** since the December issue will be a double issue for Nov./Dec. We hope you enjoy this special dedicated issue brought to you just in time for the holiday season.

Creating the Conference Program: An Update from the AAZK Professional Development Committee

Ellen Vossekuil
AAZK Professional Development Committee Chair

The professional development program for the AAZK National Conference has grown by leaps and bounds in the last seven years. Beginning in San Diego in 2011, the responsibility of accepting paper and poster abstracts was transferred from the host Chapter to the Professional Development Committee (PDC). That same year the conference format also shifted away from full days of paper presentations to a more diverse schedule with Topical Workshops, offering both open attendance workshops and smaller, more focused discussion groups. In 2012, the Professional Certificate Courses were added to the program.

The result of all of this change is a more diverse educational experience for our conference delegates. Each attendee has more options to tailor their conference experience to serve their own needs and interests. In order to provide this expanded programming, the PDC has had to rely heavily on both the Conference Host Institutions, for space and AV needs, as well as abstract submissions from AAZK members. The Conference Program will continue to evolve over the next few years to better meet the needs of our members and conference delegates.

This article will outline the current process for putting together a conference program, and how AAZK members can help us achieve our goals and expand our reach for future conferences.

Paper and Poster Submissions

The core of an AAZK Conference is networking and exchange of information. By presenting a paper or poster at a National Conference, members have a unique opportunity to share their triumphs, struggles, and great ideas in a setting that facilitates immediate feedback and connection. The process for presenting a poster or paper begins with submitting an abstract and application to the Professional Development Committee. Submission deadline may change slightly from year to year, but is always in the spring of the year of the conference. The PDC utilizes the AAZK website, the AKF, AAZK social media, and member e-blasts to communicate the submission deadlines months in advance. Once the deadline has passed, submissions go through a blind scoring process. The author names and institutions are removed from all abstracts and they are scored using a rubric to ensure the most unbiased selection. Notification to authors of acceptance or denial is generally complete a month after the abstract submission deadline. Once a paper or a poster is accepted, authors will receive information on how and when to submit their full paper or poster for inclusion in the Conference Proceedings.

Beginning in 2018 at the conference in Denver, the conference program will include concurrent paper sessions in the morning on select days. There will be paper presentations in the ballroom as in previous years, but there will also be smaller, more focused paper presentations in some of the break-out rooms. Since all of our paper abstracts are member-submitted, our exact program and topics will not be determined until we receive abstracts. This is a great opportunity for members who may feel more comfortable speaking in front of a smaller audience to get out there and finally submit an abstract.

The conference in Denver will also be the third year for poster awards. Beginning on the first day of conference PDC members will review and score each poster using a judging rubric that closely reflects our poster guidelines. The top three posters are presented with ribbons prior to the poster author session and the selected authors will receive certificates of recognition during the Conference Award Ceremony.

Topical Workshops

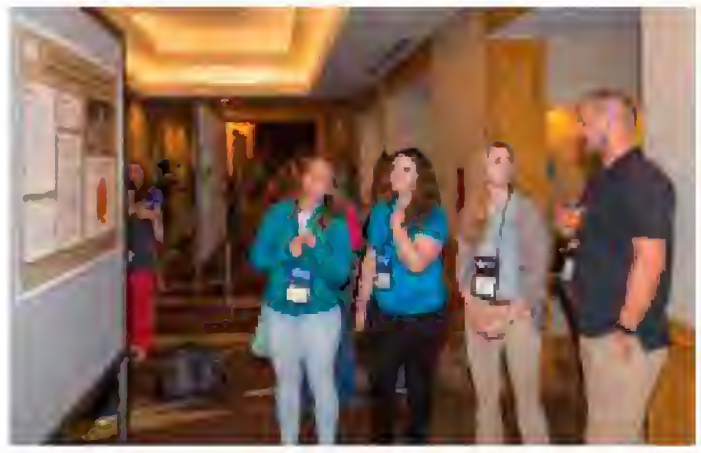
Did you know that all of our Topical Workshops are member-submitted? While the Host Institution is encouraged to submit abstracts for Topical Workshops, our schedule for this program component is entirely based on the type and subject matter of the abstracts received by the PDC. Do you have a great idea for a workshop? Do you have a workshop topic you'd really like to attend? Encourage someone you know to put together a workshop and submit the idea to the PDC.

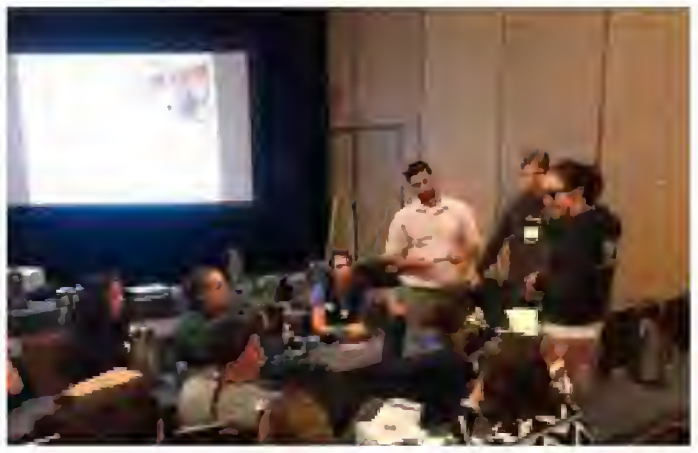
The deadline for Topical Workshop abstract submission is January 15, 2018. The PDC sets this deadline earlier to make sure we have all of our Topical Workshops in place by the time Conference Registration opens on March 1st. The scoring process for Topical Workshop abstracts is similar to Paper and Poster acceptance, with a blind scoring process and rubric to make everything as objective as possible. So, it's already time to start thinking about that great workshop idea you've had for a while now!

There are two different categories of Topical Workshops:

Open Attendance
These workshops are held in a large room with unlimited attendance capabilities. The format is best suited for a lecture-based workshop style. These workshops are open to all attendees and do not require pre-registration to attend.

Limited Attendance
This format is best suited for collaborative, activity-based workshop styles. The attendance is capped to facilitate discussion and working groups. These workshops require attendees to sign up when they register for the conference. If you are interested in authoring and presenting a workshop, you'll have to consider which format would work best. The PDC will try our best to accommodate workshop format requests, but we may need to adjust things based on member interest and hotel space. Again, the abstract and application deadline is January 15, 2018!





AAZK Professional Development Committee
First Call for Topical Workshops
2018 AAZK National Conference

The 45th Annual AAZK National Conference | Denver, CO October 4-8, 2018

Conference Theme: "Adjust Your Altitude"

First Call for Topical Workshops
The AAZK Professional Development Committee is pleased to announce the first call for Topical Workshops for the 2018 AAZK National Conference hosted by the Rocky Mountain Chapter of AAZK. The Host Chapter has chosen the theme "Adjust Your Altitude", which will highlight innovative new ideas in the animal care profession.

Deadline for Submission of Abstracts for Workshops: January 15, 2018.
Authors will be notified regarding acceptance no later than February 15, 2018.

Workshop Format
Workshop subjects should be in-depth explorations of animal health, animal management, taxa-specific husbandry, and keeper professional development. Workshops should be two hours in length. Subjects that require more than two hours should be submitted as "Part One" and "Part Two".

Open Topical Workshops
The Open Workshop format offers unlimited attendance (based on the capacity of the ballroom) and will be best suited for lecture-based workshops with a Q & A session at the end.

Limited Topical Workshops – Held in limited capacity breakout rooms, this format is best suited for small group interactive workshops and will have a cap on the number of participants.

There is a **NEW PROCEDURE** for submissions this year.
How to Submit Your Abstract for Consideration:

- Go to the 2018 Conference website: http://www.rmaazk.org/2018-national-aazk-conference/
- Download the Application for Topical Workshops
- Fill out completely and submit to pdc@aazk.org no later than January 15th

NOTE: If you do not use the new application, your abstract will not be reviewed.

Guidelines for Abstracts:

- Abstracts should be no more than 250 words and should focus on the main theme of the Workshop
- Abstracts and Applications should be submitted as a Microsoft Word® document via e-mail to: pdc@aazk.org.
- File should be named WorkshopAbstractAuthorlastname2018

Any questions should be directed to pdc@aazk.org with ATTN: Topical Workshop as part of the e-mail subject.

AAZK Professional Certificate Courses (PCC's)

The PCC's are focused 12-hour courses that cover a particular topic in-depth. The Host Institution is primarily responsible for the content of each course, but there may be collaboration with partners such as an AZA Taxon Advisory Group or Subject Matter Experts from other institutions. At the end of the course, a test is administered, and those who pass will receive a certificate of completion for the course. Are you interested in attending an AAZK Professional Certificate Course? You'll need to register for the conference as soon as possible to get your slot, so be sure to check the Rocky Mountain AAZK Chapter's 2018 conference website, http://www.rmaazk.org/2018-national-aazk-conference/ often for up to date conference registration information. The AAZK Professional Certificate Courses for 2018 in Denver are:

- Innovation in Small Primate Care
- Advanced Behavioral Husbandry
- Elevating Your Impact : Leadership Process Improvement and Team Building

The Professional Development Committee is completely focused on making the conference program the best it can be for members and attendees. In order to do that, we need our incredible members to help us keep the content interesting, engaging, challenging, and as up to date as possible. Your contributions and hard work keep this organization on the forefront of keeper professional development.

If you are interested in becoming a member of the AAZK Professional Development Committee, please contact ellen.gallagher@aazk.org. If you have general questions, comments, concerns, or suggestions, please contact the committee at pdc@aazk.org.

Treating Mobility Issues for a Komodo Dragon *(Varanus komodoensis)*

Emily Maple, Reptile Keeper III
Palm Beach Zoo & Conservation Society, West Palm Beach, FL

Hannah (formerly known as Hannibal) is an 18-year-old Komodo dragon who is on a breeding loan at the Palm Beach Zoo & Conservation Society from Miami Zoo. During breeding introductions, Hannah fell on her side and appeared to have sustained an injury that caused her neck and front leg to lose mobility and the full range of motion. Her most noticeable symptom was the flipping of her front left wrist and intermittent knuckling of the front left carpus. There was also noticeable swelling on the toes of this foot. After a medical exam, Hannah was treated for her symptoms which included antibiotics, anti-inflammatories for swelling and Cosequin for joint support. Hannah showed signs of relief within a week of treatment, using anti-inflammatory medicine. She was more mobile, and her appetite was increasing, however, wrist flipping was not improving and neck mobility worsened. Komodos use their neck to toss their food into their mouth, however, since Hannah could not do this, careful tong-assisted feeding for her was necessary. Through the use of a portable x-ray machine, veterinarians were able to diagnose her with chronic osteoarthritis and lameness.

Following the radiographs, many treatment options were discussed including drug therapy. During these discussions, one of our veterinary technicians suggested acupuncture, a more traditional type of treatment. I was aware of an instance where acupressure was performed on a dragon at Denver Zoo, and our dragon was tractable, making her a very good candidate. However; since I was not personally involved in the aforementioned case I was both hopeful and skeptical of this treatment protocol. Further examination and research of the issue eliminated my concerns and since the protocol has very few side effects and is drug-free, the veterinarian staff at Palm Beach Zoo opted to try this course of treatment.

"Acupuncture may be defined as the insertion of needles into specific points on the body to produce a healing response. Each acupuncture point has specific actions when stimulated" [1]. We contacted Dr. Cara Pillitteri, who is a Doctor of Veterinary Medicine, Certified Veterinary Acupuncturist, and a Diplomate of the American College of Veterinary Pathologists. After Hannah's first appointment was booked, a safe treatment plan was created. Since Hannah was somewhat comfortable with keepers working in her space, we decided that two keepers would need to be present for this free contact medical treatment. A safety protocol was put into place that required both keepers to hold a push pole. A push pole is a four-foot wooden pole that is approximately three inches in diameter and is held to the ground next to the Komodo dragon's shoulders. Keepers found this kept Hannah from being able to turn her head towards keepers during treatment. During radiographs and injections, Hannah showed a positive tactile response when keepers gently rubbed her shoulder areas behind the location of the poles. This tactile response included relaxing and decreasing stress response during medical procedures.

Hannah's first treatment went smoothly. As a result, the staff decided to treat her on exhibit, where there was far more room to work safely. This would allow the veterinarian staff and keepers to have more room to maneuver and exit the area if needed, and this also provided a great teaching experience for the viewing public.

Acupuncture appeared to be working because it helps to rewire the muscles.

Dr. Pillitteri talked us through the entire treatment, which included placing fine, sterile needles into Hannah's skin at specific points on the body to increase energy and blood flow. A light, electric current also flowed through some of these needles to help alleviate pain and promote self-healing. The keepers explained all safety procedures and protocols to Dr. Pillitteri to ensure she was aware of potential hazards and knew how to address them if necessary. Dr. Pillitteri was ready to move at a moment's notice if Hannah seemed uncomfortable. This careful working relationship was essential in the treatment of Hannah, as we found in the coming months. Hannah would relocate to sun-filled areas during her treatment. It wasn't unusual to watch Hannah move around the exhibit with electric therapy wires attached

Hannah receiving acupuncture therapy.

Hannah in the mobile CT scan machine.

to her, while keepers and the acupuncturist followed her side by side. Dr. Pillitteri started weekly visits for Hannah's treatment. After two weeks we started to notice some neck mobility improvements in Hannah. Within two months, Hannah was able to reach full neck extension and was even able to pick up food on her own.

As time progressed we also noticed a difference in the placement of Hannah's feet. It was almost as if she had to relearn to readjust her foot before placing it down. Hannah made some great strides towards normalcy regardless of different setbacks we faced along the way, such as cool weather and seasonal behavioral changes. Acupuncture appeared to be working because it helps to rewire the muscles. "Recent studies using functional magnetic resonance imaging (fMRI) and positron emission tomography (PET) have demonstrated the direct relationship between acupuncture point stimulation and activation of specific brain areas related to specific functions" [2]. This suggests that acupuncture is a real, viable treatment that can be used for animals that are good candidates.

What makes an animal an appropriate candidate for acupuncture therapy? "Hannah's relatively docile personality and responsiveness to her handlers are the key factors in her candidacy for acutherapy. Although the exact nature and location of her lesion are still under investigation, her clinical manifestation of stiffness and difficulty with neck and forelimb mobility suggest pain, and if the aforementioned mechanisms of acupuncture are accurate, this modality presents an option to help relieve that pain." [3].

While Hannah's treatment showed signs of improvement, there were still limitations in correcting all of her symptoms, including mobility and behavior through acupuncture. The zoo evaluated what the next steps would be by running more diagnostics on her to perform a more precise treatment. Palm Beach Zoo's Veterinary Director, Dr. Genevieve Dumonceaux, called in Dr. Pedro Armstrong with Mobile Pet Imaging (a mobile CT scan company) who would come to Hannah's doorstep to provide us with more in-depth diagnostics. A light sedation was given about 30 minutes prior to the scan to ensure a correct image was taken. Six keepers were needed to carefully carry the nearly 8-foot long, 135 pound Komodo dragon safely to the CT scan machine. The local Sun-Sentinel newspaper reporter, Amy Beth Bennet, was on hand to take video and share our now famous Komodo's story with the south Florida community. In her video report, Bennet explains, "Hannah recently had a CT scan, commonly known as a cat scan, to try to better pinpoint the source of her pain. Neck pain has left her unable to eat at times and has her sidelined from the breeding program. Hannah is the first animal at the Palm Beach Zoo to have acupuncture treatment." [4].

The CT scan results ultimately showed no skeletal damage, which is great news, although this could mean that Hannah may be on a maintenance acupuncture plan for the rest of her days in order to live a normal, pain-free life. Although the acupuncture has proven to be effective, only time will tell if it will heal her completely. Meanwhile, the treatment of Hannah's condition is ongoing. Pairing these treatments with changes in husbandry, such as softer substrates, removal from the physical stresses of breeding, offering enough heat compress therapy, and creating a wellness program for Komodos may be the answer to lengthening the lives of these incredible Varanids. Zoos are making great strides in improving the quality of life for reptiles, but not holding back on asking the question "what else can be done?" is what will ultimately improve welfare for our captive reptile populations.

Acknowledgements:

I wish to thank Dr. Genevieve Dumonceaux, Palm Beach Zoo's Director of Animal Health, for allowing such extensive comprehensive studies of Hannah's underlying conditions, Dr. Cara Pittilleri for her free acupuncture sessions with our Komodo dragon and assistance with writing this paper, Amber Landacre, our Registered Veterinary Technician for suggesting acupuncture as a treatment strategy, and finally our General Curator Janet Steele and Associate Curator Amy Anderson for supporting these cooperative efforts.

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Instructions for a Dramatic Terrarium Upgrade

Matt Mills, Wild Animal Keeper III
Kathleen Balogh, Wild Animal Keeper III
Nick Fantozzi, Wild Animal Keeper III
Steve Balogh, Wild Animal Keeper III
Shane Good, Animal Curator
Akron Zoological Park
Akron, Ohio

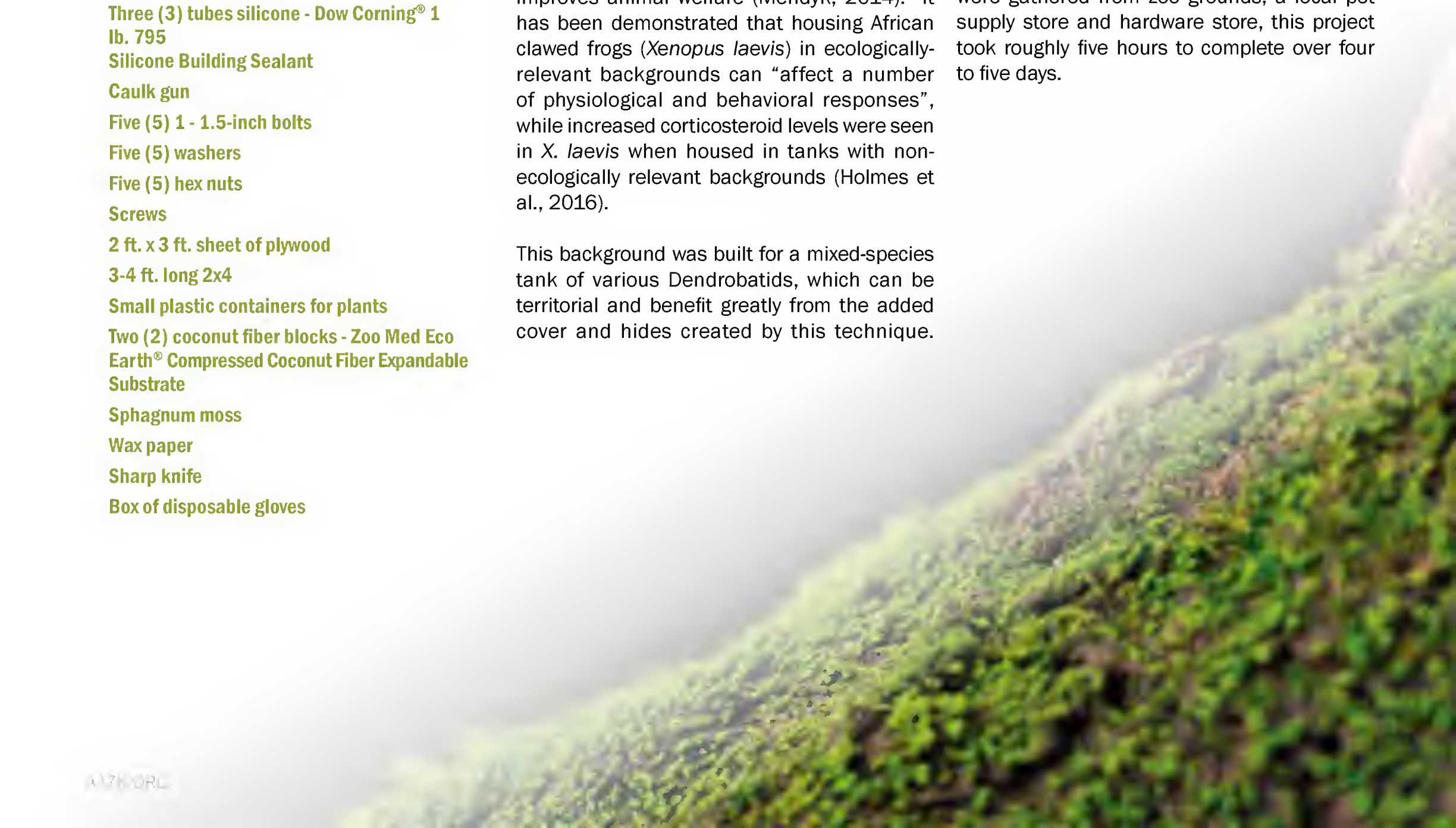
Supplies

- 20-gallon long tank
- Egg crate - Plaskolite© Suspended Light Ceiling Panel
- Two (2) cans spray foam - Great Stuff™ 12 oz. Pond and Stone Insulating Foam Sealant and/or Window and Door
- Three (3) tubes silicone - Dow Corning® 1 lb. 795 Silicone Building Sealant
- Caulk gun
- Five (5) 1 - 1.5-inch bolts
- Five (5) washers
- Five (5) hex nuts
- Screws
- 2 ft. x 3 ft. sheet of plywood
- 3-4 ft. long 2x4
- Small plastic containers for plants
- Two (2) coconut fiber blocks - Zoo Med Eco Earth® Compressed Coconut Fiber Expandable Substrate
- Sphagnum moss
- Wax paper
- Sharp knife
- Box of disposable gloves

Introduction

These instructions are for a durable, inexpensive, and easy-to-build background insert intended for use in reptile and amphibian terrariums. The end result is visually appealing and increases tank usability by increasing vertical space. Maximizing surface area in reptile enclosures by increasing vertical space improves animal welfare (Mendyk, 2014). It has been demonstrated that housing African clawed frogs (*Xenopus laevis*) in ecologically-relevant backgrounds can "affect a number of physiological and behavioral responses", while increased corticosteroid levels were seen in *X. laevis* when housed in tanks with non-ecologically relevant backgrounds (Holmes et al., 2016).

This background was built for a mixed-species tank of various Dendrobatids, which can be territorial and benefit greatly from the added cover and hides created by this technique. Additionally, creating multiple levels of vertical space allows for different options for live plants with different lighting requirements as planters can be built into the new background. The instructions that follow are intended for a 20-gallon long tank, but can be scaled up or down for any size tank. Once all of the supplies were gathered from zoo grounds, a local pet supply store and hardware store, this project took roughly five hours to complete over four to five days.



Steps

1. Soak the coconut fiber blocks to expand per the manufacturer's directions and lay out to dry for several days. Only proceed once the substrate is thoroughly dry.

2. Measure the interior dimensions of the wall of the tank that you want to cover with a background.

3. Cut a piece of egg crate slightly smaller than the tank dimensions to create a quarter-inch gap between the egg crate and sides and top of the tank. See Figures 1 and 2.

4. The egg crate will be bolted to the plywood so that the spray foam will not warp the egg crate as it dries.
   a. Set the egg crate on top of the plywood and make a mark on the plywood two to three inches inside the corners of the egg crate. Remove the egg crate and drill holes for the bolts on these marks.
   b. Place the bolts through the holes and lay the plywood down on a table so that the bolts stick up.
   c. Cover the plywood in wax paper to prevent foam from sticking to the plywood, and push the upright bolts through the paper. Place the egg crate so that the bolts are roughly two inches inside each corner, and one in the middle. More bolts may be needed if the background is going to be large. Place washer and hand-tighten the hex nuts onto each bolt. See Figures 3 and 4.

5. Determine how much space you want between the bottom of the tank and the bottom of the decorative background. You may want to make the substrate deeper is some areas than others, or to create space for a water feature. The decorative background should not be buried in the substrate or submerged when you are finished. In our example, we left two inches from the bottom since we were filling the substrate to a depth of two inches.

6. An easy way to preserve space at the bottom of the egg crate is to cover the desired space with a board. Wrap a 2x4 board in wax paper and screw it onto the plywood so that the portion of egg crate you do not want covered in spray foam is protected. (Optional step) See Figure 5.

7. Spray a roughly one-inch layer of spray foam over the entire egg crate. As soon as you are done applying the spray foam, place the empty plant containers in predetermined locations, and let set overnight. See Figures 6 and 7.

8. Apply another layer of spray foam to cover the plant containers creating roots, ledges, and texture. Try to keep spray foam out of the plant containers. Allow to set overnight. See Figure 8.

9. Remove the 2x4 (if using), and trim excess spray foam off of the background with a sharp knife. Pay particular attention to trimming the sides and top edges, as well as removing any spray foam from the inside of the plant containers. Brush or vacuum off any loose pieces of spray foam. See Figure 9.

10. Spread ⅛-¼ inch layer of silicone over all of the spray foam, paying particular detail to pushing the silicone into the crevices and edges. Any exposed foam has the potential to be eaten by feeder insects, which are then consumed by the tank inhabitants; the silicone protects the foam from insects. Wear gloves and work quickly as the silicone can start to set in less than 20 minutes. The inside of the plant containers do not need silicone. See Figures 10 and 11.

11. Before the silicone can set, spread a thick layer of dry coconut fiber that was soaked, broken up, and dried thoroughly before beginning the project onto the silicone. Push the fibers into the silicone, and let the silicone dry overnight or longer depending on the silicone manufacturer's instructions. See Figure 12.

12. Lift the sheet of plywood and shake off excess coconut fibers.

13. Examine the background for areas of exposed foam or silicone. These areas can be touched up with more silicone and coconut fiber, but it is much easier to take your time and do a thorough job during the first application. See Figure 13.

14. Once all the silicone and fiber work is completed, remove the bolts from the back of the plywood, the nuts will remain in the background, then remove the background from the plywood.

15. Test to make sure the background fits in the tank. If it's too tall, some egg crate can be trimmed from the bottom. If it's too wide, some fiber, silicone, and foam can be trimmed from the sides, and re-treated with silicone and fibers.

16. Clean the tank thoroughly.

17. Put a bead of silicone around the edges and across the middle on the backside of the background, and cover the hex nuts to reduce any chance of rusting as well. See Figure 14.

18. Place the background in the tank and press it into the glass so that the silicone adheres to both surfaces. Allow to dry for at least a few hours.

19. Layer the preferred substrate in the bottom of the tank up to the bottom of the background. (We chose Light Expanded Clay Aggregate (LECA) balls, mesh, and Atlantic Botanical Gardens (ABG) soil mix for this tank). See Figure 15.

20. Place plants in planters and stuff any small gaps between the background and the sides of the tank with sphagnum moss. See Figure 16.

Terrarium Upgrade

Figure 1 - The egg crate is measured to fit the inside of the tank.

Figure 2 - A ¼ inch gap has been left between the egg crate and the top and sides of the tank.

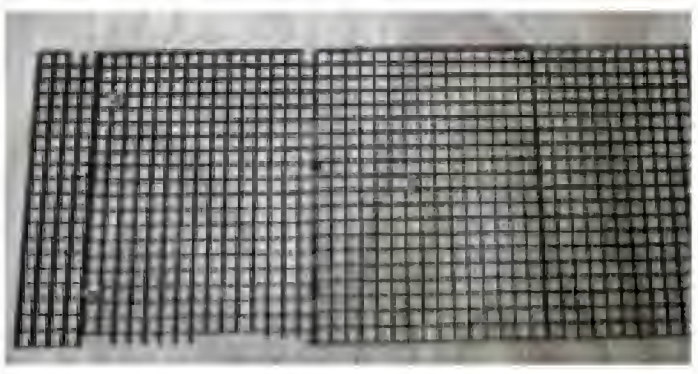


Figure 3 - The egg crate has been secured to a sheet of plywood covered in wax paper.

Figure 4 - Bolts have been pushed through the back of the plywood, and the egg crate secured with washers and nuts.

Figure 5 - The portion of egg crate that will be below the substrate has been covered with a 2x4 wrapped in wax paper.

Figure 6 - The first layer of spray foam has been applied.

Figure 7 - Empty planter containers are placed before the foam dries.

Figure 8 - The second layer of spray foam has been applied to add texture and depth.

Figure 9 - Excess foam has been trimmed away with a sharp knife.

Figure 10 - Silicone is being applied.

Figure 11 - All of the spray foam has been covered in silicone.

Figure 12 - A thick layer of coconut fiber has been pressed into the silicone before it can start to dry

Figure 13 - The finished background before being placed in the tank.

Figure 14 - Silicone has been applied to the back of the background to secure it to the tank.

Figure 15 - The finished background with substrate before plants and animals are added.


Figure 16 - The finished tank.

Tips

- Purchase contrasting colors of silicone and spray foam. The contrast will make it easier to see where you need to apply silicone.
- The Great Stuff™ Pond and Stone spray foam is better for larger areas because it expands quickly and covers more area. The Great Stuff™ Window and Door spray foam expands less and slower, making it better for creating details or filling spots missed when using the Pond and Stone.
- Plan where your plants and features will be before you start the project, it may be useful to sketch your design, keeping the final height of the plants in mind.
- Practice your spray foam, silicone spreading, and coconut fiber application techniques on some scrap egg crate before starting your background, this will give you an idea on how the materials behave.
- Damp coconut fibers do not stick well to the silicone sealant. Dry the coconut fibers as much as possible before spreading on the silicone. It is also important to keep your hands and work area dry, as silicone cannot adhere to any water.
- Recruit several people to help you spread the silicone so it does not dry before you finish spreading it, and pay special attention to the sides and small pockets in the spray foam.
- Spray foam will dry in the applicator and can's nozzle overnight, rendering the can unusable. This problem can be solved in two ways:
- Before the foam dries, remove the applicator from the can and place screws in each end of the trigger, a wire through the tube, and another screw down the can nozzle. The screws and wire can be used to pull the dried foam out the next day. This method requires some planning, but yields more consistent results.
- Steps seven and eight can be done at the same time. This method takes less time, and there is no need to clean out the spray foam nozzle, but it is hard to predict how thick the spray foam will expand and could cause the background to warp.

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All terrarium photos courtesy of Animal Keeper Matt Mills.

COORDINATORS: Jay Pratte, Henry Doorly Zoo • Kim Kezer, Zoo New England • Angela Binney

Thinking Outside the "Box": Alternative Crate Ideas for Skittish Animals

Crystal Bryant, Relief Keeper
Contributing Authors: Janice Thompson, Lead Keeper of Small Animals & Clair Hallyburton, Apes Primary Keeper
Utah's Hogle Zoo
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Figure 1 (top left), Figure 2 (top right), Figure 3 (bottom).

The use of crates, animal carriers, squeeze boxes, or other means of animal containment is a very important tool in a zoological setting. Crates can be used for transport, temporary holding, introductions, and even to aid in medical immobilization or management for some species. However, getting an animal in a crate can sometimes be very difficult due to resistance from the animal. Being contained in a small space and being moved around can be very scary for some animals. Being unable to leave, not being able to see what is going on, or simply tight spaces could all potentially be factors in what makes crates aversive to some animals. If a crate behavior is not trained, the animal would most likely need to be netted, hand-grabbed, corralled, or pushed into a crate, depending on the size of the animal and the situation. All of these methods, while ultimately effective, can be harmful mentally and/or physically for the animal as well as the keepers and may be potentially damaging to the keeper-animal relationship. By training a crate behavior using positive reinforcement techniques, we can reduce the risks involved. However with some animals this can be easier said than done. This paper will outline a few examples on how crate selection can have a big impact on training success.

Utah's Hogle Zoo was home to 0.1 female cotton-top tamarin *(Saguinus Oedipus)* and 1.0 sub-adult golden-lion tamarin (*Leontopithecus rosalia*). While both animals were born at the zoo, (1993 and 2009 respectively), neither had been crate trained. Being small primates, if they needed to be crated they were usually hand-grabbed or corralled into a removable nest box. In the spring of 2016 we began

training a crate behavior with both tamarins using a typical animal carrier shown in Fig.1. Many other small mammals crate well with this type of crate, but the tamarins seemed very cautious of it possibly due to past negative experiences or just fear of the appearance of the carrier. We decided to try a different crate that we used for some of our birds (Fig.2). This carrier has clear sides all the way around and our thought was that they might feel more comfortable if they could always see where the trainer was and what they were doing. So we gave it a shot.

Before the crate training, both tamarins were target trained and were comfortable taking food from trainers. The new shaping plan began with desensitization by presenting the carrier in the exhibit and then reinforcing them for simply staying in the exhibit with us while it was in there. The next step was to target them closer and closer to the crate. Once they were targeting near the crate, with it being clear, we were able to place the target on the crate in a way so they had to enter the crate to get the target. The final stage was to phase out the target.

We saw immediate success! Within five training sessions over three days the male golden-lion was entering the crate, and within a couple of training sessions the female cotton-top was also going in when cued. I believe that the ability to see through the crate was the key. Since the crate was a clear acrylic, the tamarins could see the trainer and everything we were doing while they were in the crate. The tamarins are a visual species and very skittish to movement. The clear acrylic crate allowed them to maintain visual access to the trainer while in the carrier, which was not an option with the first carrier we used. Another benefit of this crate was that the trainer could give reinforcement through both the back and the front of the crate. This encouraged them to come all the way to the back of the crate and then as soon as they turned around the trainer was able to reinforce that approximation from the front end of the crate. The cotton-top was very food motivated and we were able to crate her multiple times. This was important because she was geriatric, retaining fluid and needed to be removed from the exhibit to go the hospital for multiple treatments. Luckily, this all occurred without much, if any, regression. The golden lion tamarin on the other hand, crated wonderfully until he was removed from the exhibit for a routine medical exam, which resulted in measureable regression. We have begun re-training this behavior by taking a few steps back in our shaping plan and he is continuing to progress with his training.

The second example involves an Orange-winged Amazon Parrot (*Amazona amazonica*) that is typically very fearful, particularly of novel objects. In the winter our 1.1 Amazons live in an indoor exhibit together. Our female yellow-naped Amazon parrot (*Amazona auropalliata*) was already crate trained. Our male, however, would not come down or even approach the keeper when the crate was in the exhibit. The crate used for the Amazons is a wire crate which they can see out of on all sides (Fig.3). Still, he was not willing to come near it. We had also previously used the crate from Fig.1 with him for transport so he was avoidant of that one as well. The only option we had to move him was to physically restrain him. This had to be done multiple times per year during our colder seasons due to weather as well as for medical treatment, which was not ideal. Thankfully, the first experience he had with the crate from Fig. 2 was much better. When the crate was presented on a platform in the exhibit, the assumption was that he would only go higher into the trees. However, surprisingly he walked right up to and into the crate as if he had been doing so for years. (Considering this animal was a previous pet 28 years ago before being donated to the Zoo, we did not have many details about this individual's history, so it is possible that he had seen a crate similar to this one before.) The behavior has remained consistently strong and he will now enter the crate from anywhere in the exhibit and remains calm while closed in. We have been able to move him between his two exhibits thus far this year and it has been a much better experience for both the parrot and trainers involved.

The last example I would like to share involves 0.1 guenon. The carrier selection played a similar role in her willingness to enter the crate. At 35-years-old, this guenon was quite geriatric. She could not see well and was hesitant to enter the dark carrier from Fig. 1. Not much light could enter the carrier which made it much more difficult for her to see anything. She was unable to see the target or any reinforcement dropped into the carrier or presented through the sides. Another carrier was found that had much more wire covering instead of opaque plastic, enabling more light to get through (Fig.4). With the ability to see the reinforcement she began to easily enter the carrier. The training continues for this animal and the next step is being able to close the door.

Figure 4

Training Tales...

We want to hear your Training Tales: the good, the bad and the fabulous!

Did you enjoy the latest Training Tale? Was this information useful or inspiring? Do you have any operant conditioning experiences that others would benefit from reading? Please submit your "Training Tales" and experiences in operant conditioning to share with *Animal Keepers' Forum* readers. This opportunity provides a convenient outlet for you to exhibit your training challenges, methods and milestones with the AAZK member network. Please submit entries based on the following guidelines:

a. Submit a brief description of a training project at your facility. These can be 500 words or less, in text or bullet points – it can be longer (up to 1000 words); however, short and simple descriptions with a few images are just as perfect. Details should include the following:
   1. Define the training goal (what did you try to do and for what purpose?)
   2. List important steps (How did you do it – include plans that changed along the way/what worked and what didn't work)
   3. Timeline used (how long did it take)
   4. Tips you learned along the way

b. Include 3-5 digital photos that clearly depict the animal in the learning process or performing the desired goal (provide photo caption and photographer of each image). Photos need to be 300 dpi and at least 1200 x 1800 pixels.

Please send submissions or questions to:
Kim Kezer at kkezer@zoonewengland.com
or
Shane Good at shane.good@aazk.org
(use Training Tales Submission
as the subject).

While a lot of these crating successes may have to do with the trust and training history we have built with our animals, we believe the tools played a strong role it the success. With the internet these days, you can easily find all of the varieties of crates, carriers, and squeeze boxes available on the market today. Crates small, or large, can be found in many more shapes, sizes, materials, and layouts than in the past. The need to use what has been used before is no longer necessary. Crate training could be one of the most important behaviors we train with the animals. Keeping an open mind on what tool to use to accomplish this goal could not only expedite the process, but make it a smoother and calmer experience for the animals (and trainers!) along the way.

Training Tales Editorial Comments

By Angela Binney

The keepers at Utah's Hogle Zoo bring up one of the most overlooked tools when shaping a new behavior; environmental manipulation. By thoughtfully selecting the best crates for each different species based on their individual needs, the keepers created an environment for the animals to be successful.

It is a good idea to include crate training (or chute, trailer, tube or box) as a part of routine husbandry to help avoid or reduce future resistance to these ever-essential devices. This also allows time for problem solving in advance so that your team and the animals are ready when the time comes. There are many resources available for crate designs and basic training plans for crate desensitization so I'll avoid going into those details here. But I'd like to point out three key factors that I have learned with training animals to calmly enter and hang out in a crate, trailer, or chute:

Plan ahead: Pre-planning and crate selection can be just as important as the actual training of the behavior. As with any other operant conditioning plan, it is best to plan ahead and allow time to work out all of necessary details in advance. Evaluate the animal's natural and individual history in addition to the necessary function of the crate for the intended use.
Take your time: Once the plan and crate are ready to go, work at the animal's pace, investing time to not only desensitize the animal to the physical set up but also the function of any moving people or parts. Before venturing toward shutting any doors or moving anything, the animal should be calmly hanging out in the crate, eating in the crate, enjoying enrichment in the crate, etc. During these sessions, slowly approximate the keeper(s) to the proximity needed to offer reinforcement at just the right moment. After the reinforcement can be delivered effectively, progress to the next steps of the plan including touching the door, gently moving the door, approximating to closing the door and open the door back up, reinforcing the animal for calmly staying still in the crate. Sure, this calm hanging out business can be boring (or relaxing, depending on your view). But we want this part to be boring because it means the animal is not excited, jumpy, or trying to leave.

Know when to say when: It is very tempting to keep going when an animal is doing great. But as with any training project, it is important to end each session on a good note and avoid reinforcing the undesirable behaviors that may begin once the animal has had enough. If the animal moves before you give the cue to release it from the behavior (staying still and calm in the crate), cue the animal back into the desired position and reinforce. I like to use a cue to ask the animal to exit the crate so it is clear when the session is over. So once back in position and reinforced, give the cue to exit the crate and then reinforce to end the session on a good note. A short and sweet session that allows you to reinforce what you're looking for – a calm animal in a box – is way better than a long session that ends on a bad note.

Whether you are training for a transport event, a procedure, or a management need, a basic crate training plan is a great addition to animal husbandry routines. Creative action planning paired with controlled implementation can really make a great difference in the quality of experience relating to these valuable tools.

Thank you for sharing your Training Tale!

Ex Situ Conservation and Recovery Efforts for the Western Striped Newt at the Jacksonville Zoo and Gardens

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Introduction

Amphibian communities are experiencing unprecedented declines throughout the world, and today, many of the planet's amphibian species are threatened with extinction (Houlahan et al., 2000; Stuart et al., 2004; Grant et al., 2016). A number of factors have been implicated in these declines, particularly emergent amphibian diseases such as chytrid fungi (*Batrachochitrium dendrobatidis* [B.d] and *B. salamandrivorans [B.sal]*) and Ranavirus, habitat destruction and degradation, and climate change (Young et al., 2001; Stuart et al., 2004; Grant et al., 2016). In light of such significant conservation challenges, there exist many opportunities for zoos and aquariums to join global efforts to study, manage and curtail these declines. Indeed, zoos and aquariums have become important leaders in amphibian conservation and have proven to be valuable assets to these efforts, particularly with regards to establishing ex situ assurance colonies of threatened species and producing captive-bred offspring for repatriation to help bolster and restore wild populations (Gascon et al., 2007; Gagliardo et al., 2008; Griffiths and Pavajeau, 2008; Reid and Zippel, 2008).

The striped newt, *Notophthalmus perstriatus*, is indigenous to Florida and Georgia, USA where it occurs predominantly in longleaf pine sandhill ecosystems (Fig. 1). Although currently recognized as a single species, two genetically- and geographically-distinct variants exist (an eastern and western clade) which are likely to be split into two distinct taxa in the future (May et al., 2011). The eastern clade ranges in Florida east of the Suwanee River and in a few localized areas on the Atlantic Coastal Plain of Georgia, whereas the western clade is distributed along the Gulf Coastal Plain of southwestern Georgia and the eastern panhandle of Florida. Although populations of both clades have been in decline over the last several decades, the western clade has experienced a mysteriously rapid decline since 1999, particularly in Florida where most

sites formerly occupied by the western striped newt are now believed to be devoid of wild populations (Means et al., 2008). The last known Florida stronghold for the species was held in the Munson Sandhills region of the Apalachicola National Forest (ANF); however, less than 10 adults have been observed there since 1998, and the population may now be extirpated (Means et al., 2012).

A Conservation Strategy for the Western Striped Newt

Given its imperiled status throughout its range, efforts are currently underway to assign legislative protections to the striped newt (e.g., it is currently listed as a "candidate species" by the USFWS; Means et al., 2008), and collaborative efforts involving NGOs, governmental agencies, and zoological parks seek to identify factors contributing to its decline as well as develop and implement sound strategies for its conservation and recovery. In 2010, a long-term, multifaceted study was initiated by the Coastal Plains Institute (CPI) and colleagues to investigate causes for the species' decline and suspected extirpation from the Apalachicola National Forest, conduct repatriations with larval newts in prime wetland habitats, and investigate and implement precautionary measures to ensure the success of repatriated individuals (Means et al., 2009).

Seeking assistance from AZA-accredited zoological parks that could establish and sustain captive assurance colonies of the western striped newt, produce captive-bred offspring for repatriation, and investigate aspects of their biology and husbandry, the Jacksonville Zoo and Gardens (JZG) joined the project in 2012, aligning with the Memphis Zoo as ex situ collaborators. Captive-bred offspring produced at the Memphis Zoo and JZG each year are released into selected wetland sites within the ANF, where they are then monitored for survivorship, migration, recruitment and mortality by the Coastal Plains Institute and collaborators. Given JZG's proximity to the ANF, the zoo's herpetology department staff regularly assists with releases and other related field activities (Fig. 2.). More recently, two additional zoos in Florida have joined the project and currently maintain captive colonies of western striped newts with the goal of producing further captive-bred offspring for repatriation.

Ex situ Management

At the Jacksonville Zoo and Gardens, western striped newts are kept separately from the zoo's main herpetological collection in a biosecure laboratory located at its Amphibian Conservation Center to prevent potential exposure of the newts to amphibian pathogens that could then inadvertently be introduced into natural wetlands with repatriated individuals. The laboratory is on full display through large viewing windows, allowing visitors to observe and learn about the project and the ex situ work that is being carried out at the zoo on a daily basis (Fig. 3). Inside the laboratory are a series of metal shelving racks supporting large polycarbonate tanks and their respective filtration systems; several of these tanks have been used to house adult breeding pairs of newts, while others have been used for rearing and head-starting offspring intended for release (for additional husbandry information, see Means et al., 2014, 2015, 2016).

Reproduction typically begins in late fall and early winter and continues into spring, with eggs usually produced between January and May. Once the eggs hatch after about a week, the free-living larvae are grouped and housed together based on their body sizes until their release. Originally, offspring were only repatriated shortly after hatching, but in recent years some of the offspring have been held back for several months of head-starting and are often approaching sexual maturity or have already begun producing eggs at the time of their release. It is hoped that releasing larger sub-adult and young adult individuals will yield better results in terms of survivorship and recruitment in the wild.

Since 2013, more than 1,400 captive-bred newts including both larvae and adults have been repatriated back into the Apalachicola National Forest, with nearly 1,200 of these individuals contributed by JZG (Figs. 4-7). Continued monitoring and periodic surveying for repatriated individuals at recipient wetlands in the ANF by the Coastal Plains Institute have documented and confirmed successful reproduction by repatriated individuals, as well as the migration and return of released individuals to breeding ponds in subsequent seasons (Means et al., 2016). Despite these successes, repatriation efforts would be greatly enhanced by the release of many additional individuals, as this would increase the chances of some repatriated individuals surviving and reproducing, and also allow for additional wetland sites within the ANF to be seeded with repatriated individuals.

A ubiquitous problem for many zoos and aquariums (i.e., Mendyk, 2014), space has proven to be a limiting factor affecting the total number of newt offspring that are produced and available for repatriation each year. In particular, limited housing facilities for larval newts at JZG have led to greater stocking densities of offspring in rearing tanks. Larval newts are voracious and indiscriminate feeders; at higher densities they can become cannibalistic, ultimately affecting survivorship and

Fig. 1. (opposite page) An adult striped newt returning to a breeding pond. Photo by: Ryan Means.
Fig. 2. (below) Jacksonville Zoo and Gardens (JZG) herpetology staff in the field assisting with newt releases. *Photo by: JJ Vitale.*

Fig. 3. Striped newt conservation breeding laboratory at JZG. *Photo by: Robert W. Mendyk.*

Fig. 4. Dozens of captive-bred striped newts awaiting release. *Photo by: Robert W. Mendyk.*

Fig. 5. JZG herpetology staff releasing captive-bred striped newts back into the wild. *Photo by: Robert W. Mendyk*.

the total number of offspring available for release. Rearing larvae in smaller groups would inevitably reduce instances of cannibalism and improve survivorship. Along similar lines, limited holding space at JZG has also restricted the number of adults that can be maintained for breeding at any given time. Incorporating additional tanks would allow for more breeding pairs to be maintained and likely increase the total number of offspring produced each year for repatriation.

The Jacksonville Zoo and Gardens was recently able to expand upon and enhance its ex situ holding facilities for *N. perstriatus* through the generous support of AAZK's 2015 Conservation, Restoration and Preservation Grant. This $997.86 in funding facilitated the purchase of equipment and materials needed to construct an additional rearing system for larval striped newts at JZG. The new 12-tank system (Fig. 8), replete with filtration, will facilitate the rearing and head-starting of up to 600 striped newt larvae in lower densities, while also freeing up several existing tanks formerly earmarked for larval rearing and head-starting. By transferring larval offspring to the new system, existing enclosures will be repurposed for additional breeding adults. With some minor modifications and updates to the infrastructure and life support system of these enclosures, JZG will have more than doubled its holding capacity for adults, which will hopefully maximize total reproductive output. In addition to directly benefiting repatriation efforts, increased production can benefit the captive population by enabling additional facilities to establish assurance colonies and eventually contribute offspring of their own to recovery efforts.

Outlook

As one of its most successful and important conservation projects, the Jacksonville Zoo and Gardens is committed to the recovery of the western striped newt, and will continue to work together closely with the Coastal Plains Institute and other partnering organizations and agencies to refine and maximize these efforts. Since the western striped newt has been extirpated from most historical wetland sites throughout its range and known breeding populations are becoming increasingly scarce, the future of the species may be entirely dependent on the continued support of ex situ breeding programs like the one at JZG. The recent financial assistance from AAZK in support of this project will enable JZG to increase its contributions to recovery efforts for this important species.

Beyond its direct conservation implications for the species, this conservation project also exemplifies the importance and value of collaborative research and inter-zoo partnerships. Moreover, it provides a successful collaborative model for bridging the gap between in situ and ex situ research that zoos seeking involvement in reptile and amphibian conservation can follow and replicate. Through cooperation and collaboration with other zoological parks on striped newt husbandry and reproduction, particularly the Memphis Zoo, and rigorous in situ monitoring by the Coastal Plains Institute and partnering agencies, we are optimistic about future recovery efforts for the western striped newt in Florida and across its range. We welcome correspondence and inquiries from colleagues and zoological facilities that may be interested in joining this important initiative or offering logistical support.

Acknowledgments

We wish to thank the American Association of Zoo Keepers (AAZK) for generously providing funding support, Ryan Means and the Coastal Plains Institute for their continued leadership, friendship and support, and Steve Reichling and the Memphis Zoo herpetology department for their collaboration and partnership on ex situ aspects of this project. Lastly, we thank our colleagues in the JZG's herpetology department as well as John Lukas, Lucas Meers, Alan Rost, Dan Maloney and Tony Vecchio for their assistance and unwavering support.

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Fig. 7. Recently released adult striped newts. *Photo by: Ryan Means*.

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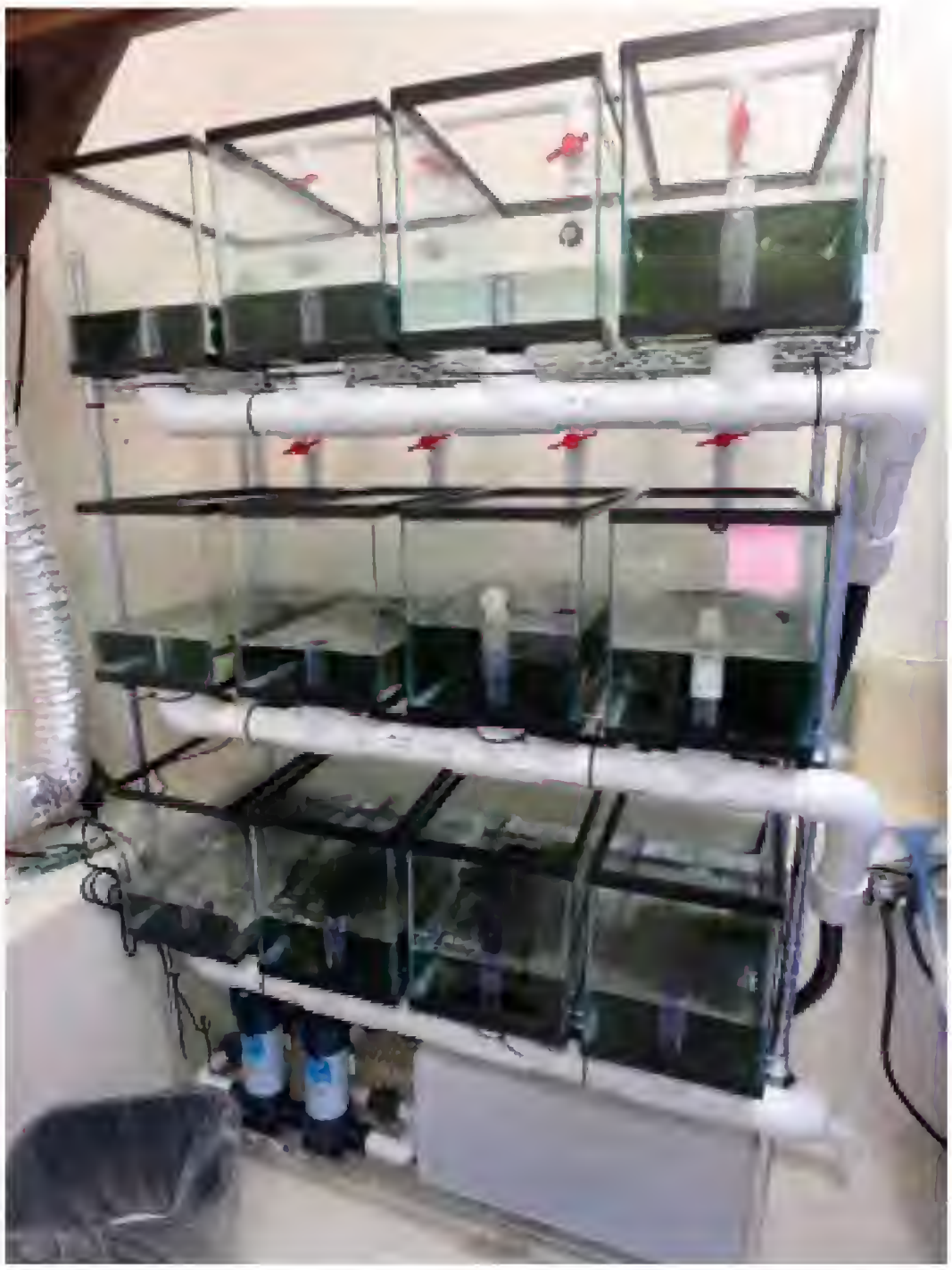
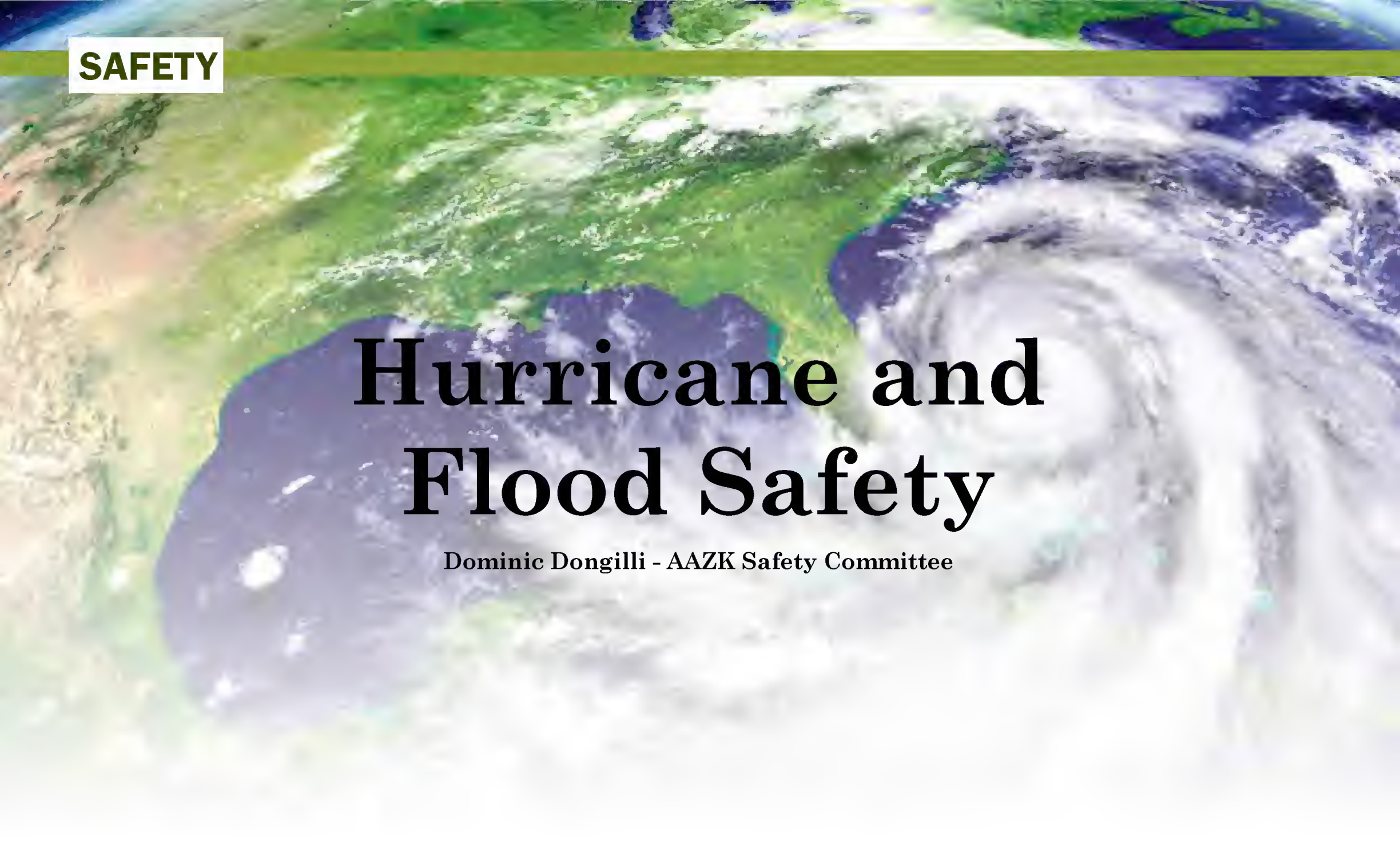
Fig. 8. New larval newt rearing system, made possible by an AAZK grant. *Photo by: Robert W. Mendyk*.





Hurricane and Flood Safety

Dominic Dongilli - AAZK Safety Committee

1. Introduction

Hurricanes are powerful weather phenomena. Their devastating effects are amplified by their irregular and repeat occurrence throughout the storm season, which typically runs from the summer into fall seasons. The 2016 Atlantic hurricane season was notable in its severity, being an "above-normal" year for the first time since 2012. Hurricane Matthew was compared to 2007's Hurricane Felix for its severity, and 1999's Hurricane Floyd for its significant inland flooding and loss of life (NOAA, 2017). Furthermore, there is an interest in the possible relationship between storm frequency, intensity and anthropogenic climate change.

Addressing hurricanes and flooding is a daunting task. The difficulty of such work is only complicated for zoological institutions. In addition to the health and safety of staff and guests, institutions are responsible for dependent animals with specific care and safety requirements. Zoological institutions must be vigilant and engage in regular efforts, both proactive and retroactive, to address the potential impacts of hurricanes and flooding.

Many ask what significant role zoo keepers play in institutional planning and response – a valid question. The answer lies in the extensive knowledge zoo keepers have regarding the operations of their given areas. It is zoo keepers who are best equipped to assess relevant risks and their severity due to this detailed knowledge, subsequently determining what is of immediate concern and communicating their findings to upper management. Conversely, when zoo keepers understand what has to be considered in the planning process, they are able to provide more pointed and pertinent constructive criticism when institutions publish a "Continuity of Operations Plan," or COOP, for review. A more knowledgeable staff, at all levels and within all departments, results in a more adaptable and responsive organization; ultimately enhancing the animal care.

2. Apples and Oranges: Storm forecasts and preparation resources

Navigating multiple storm resources with different terminology, and subsequently integrating that information, presents challenges when preparing for, and assessing, the threat of a potential natural disaster. Fortunately, the task is not impossible and there are community organizations that are invested in the safety and success of zoos to weather hurricanes and flooding successfully.

Getting the Information

The National Weather Service (NWS) as a part of the National Oceanic and Atmospheric Administration (NOAA) monitors weather conditions and potential storm activity across the United States. Its mission is to provide weather information "...for the protection of life and property..." and does so through up-to-date forecasts and weather education resources ("About NOAA's National Weather Service"). It is this organization that developed and implements a standardized weather notification system using the now familiar terminology including "advisory," "warning," and "watch," to denote the threat level of potential storms ("National Weather Service Glossary," 2009). Such information is subsequently disseminated through NOAA Weather Radio stations and devices, including its own website. The forecasts, advisories and safety tips they provide are up-to-date and used to inform crisis management decisions on the ground.

Basic Concerns and Preparation

The Federal Emergency Management Agency (FEMA) works to inform organizations across the United States on best practices and associated risks of weather emergencies including floods and hurricanes. It is FEMA that compiles flood hazard maps and further information to assess the risk potential within communities. While helpful, the information provided by FEMA is macroscopic in its approach, focusing on community-wide weather response and individual homeowner responsibilities.

Fortunately, there exists another resource specifically for animal care organizations. The

Zoo and Aquarium All Hazards Preparedness, Response, and Recovery (ZAHP) Fusion Center facilitated by the Association of Zoos and Aquariums (AZA) is an open resource meant to assist zoological facilities stay up to date on current safety topics and practices, including hurricanes and flooding. ZAHP monitors potential emergencies across the United States and compiles the zoo-pertinent information for easy access. It further offers assistance to organizations facing a severe weather emergency and can establish connections with community resources.

You're not in this alone

It is good practice for all zoological institutions to reach out to appropriate public safety organizations prior to any imminent weather threat to establish proactive, reciprocal relationships. It was a well-established relationship that facilitated better communication and information flow at Jacksonville Zoo and Gardens (JZG) when faced with a severe weather emergency. Rick Holzworth, Security and Safety Manager at JZG, had a staff member ride out Hurricane Matthew at the Duval County Emergency Office of Communications a part of their COOP. Holzworth and the institution benefited immensely from this placement, as they were able to receive firsthand information including weather updates, citywide contingency planning, and broader transportation infrastructure conditions in order to coordinate their own recovery. This placement was made possible by the institution's pre-established relationships with emergency services, which allows for well-rehearsed and knowledgeable assistance on behalf of the community. The benefits of such relationships extend far beyond the consequences of any one emergency situation.

Zoological institutions have a natural advantage when it comes to establishing relationships with community partners. It is difficult, but ultimately possible, to make the standard safety planning process more fun and exciting when it takes place at a zoo. Discussing site-specific information will include touring behind-the-scenes animal areas and further animal encounters that even the steeliest of emergency management professionals can't likely resist! Take advantage of this interest to better make known the institution's needs and cultivate strong relationships.

For all the benefits they can provide, internal and external partners often don't have the zoo-specific supplies necessary for animal care. At this point, zoos will need to extend their horizons and work with other animal care institutions to create "Partnership Agreements" (PA's) or "Memoranda of Agreement" (MOA's) to exchange or purchase necessary items in the event of an emergency.

The local pet shop may be able to cover the transportation needs for small mammals and reptiles, but when it comes to large mammals and primates, that dog crate will not suffice. Are there other institutions within reasonable distance that could provide a suitable transport crate? A large-scale weather event may interrupt national (or international) shipping schedules. Are their local animal feed stores or farmers that would be able to assist in supplying staple grains and feedstuffs for applicable animals? What about replacement fencing, appliances or generators? Establishing these PA's or MOA's with sufficient detail outlining necessary materials, supply transfer, and compensation, positions institutions for success and wastes little time when faced with a weather emergency.

3. At Your Local Facility...

Each zoo is different, and the role of the animal caregiver in the institution's COOP varies, but it is essential that zoo keepers are all aware of weather-associated risks and how they may impact the facility in order to be effective in times of emergency. The collective power of all staff is necessary to insure the safety of guests, employees and animals.

Above all else, the key to successfully surviving a hurricane and flooding event is preparation. When it comes to safety, the best defense is always a good offense. Paula Mills, Resource Specialist at Disney's Animals, Science and Environment, along with Holzworth, credits extensive pre-season preparations with successful hurricane and flood management by addressing potential hazards before they occur. Mills credits "organized and focused cleanup efforts, prior to hurricane/flooding season" as one key to the company's success when addressing hurricane and flood safety.

Follow the water

When the rain comes, where is the water going to go? Across the facility, mapping the topography and its elevation predicts where water will collect and what individual structures will most be at risk for flooding and water damage. Unfortunately, this aspect of the facility cannot be easily changed, but do not be fooled into thinking that there is nothing to be done.

Mills advises institutions to "have a walk-through to identify storm water paths and drains, including run-off flows and erosion potential." Water paths will only be effective if any surrounding mobile debris is removed and erosion prevention methods are enacted to prevent any blockages. Holzworth then suggests following those pathways in reverse, "storm runoff goes to a central runoff or retention pond, but when that is full the water will backflow out of the original storm drains. At that point what is now at risk?" It should not be a question of "if?" but "when?" will floodwaters collect and how is it going to be addressed? Even if run-off paths are clear and fully functional, the potential for flooding is still high.

Sandbags are often used to direct the flow of water, contain debris, filter sediment and better seal potential water entry-points of any given structure. Believe it or not, "there actually is a proper way to fill a sandbag," says Mills. Often, institutions will have a designated team to prepare sandbags to centralize and triage the response. These teams should be trained in filling, folding and stacking techniques to maximize efficiency and effectiveness. Furthermore, the team must be informed of safe lifting practices to prevent back injury.

Within animal areas, zoo keepers should be cognizant of building contents. Of upmost

Helpful Organizations & Links

Federal Emergency Management Agency (FEMA):
https://www.fema.gov/

Zoo & Aquarium Hazard Prepardness Program (ZAHP):
http://zahp.aza.org/

National Weather Service (NWS):
weather.gov

Occupational Health & Safety Administration (OSHA) - Flood Preparedness & Response:
https://www.osha.gov/dts/weather/flood/

Occupational Health & Safety Administration (OSHA) - Hurricane Prepardness and Response:
https://www.osha.gov/dts/weather/hurricane/

concern are the extensive and complex life support systems that are integral to the care of marine and invertebrate organisms. Outside of these systems, all animal care areas have contents that are at risk. What appliances are in the building and are they elevated off the ground? Are they permanent or can they easily be moved to a safer location to prevent water damage? What is contained in storage areas and office spaces? Are important paper records digitally stored as well? Should electronic equipment be moved or stored in another location? These are all questions that must be asked and subsequently addressed by keepers within animal areas. Dedicated facilities or IT personnel are most likely focused on major infrastructure protection when faced with a large-scale weather emergency.

For animals within secured holding spaces, "finding higher ground" literally means climbing vertically within the secured space. Thus, zoo keepers must ensure there is secure perching in adequate numbers for all animals. Furthermore, food delivery chutes and water delivery devices, such as swine spigots or automatic watering bowls, may not be accessible should water or debris begin to accumulate at ground level where they are often placed. There should be alternate locations within animal holding spaces, such as bowls or ledges along the perimeter, where diet items and fresh water can be safely distributed whilst avoiding contamination.

Don't blow over wind hazards

In addition to flooding and water damage, high winds are also significant safety hazards during hurricanes and tropical storms. These high winds have the potential to make those bulky and awkward zoo keeping tools into airborne missiles! Any free-floating objects stored in and around exhibit spaces should be collected and secured. If there is not room inside a secured structure to store these items (remember, the most delicate/water-sensitive items receive first priority for indoor storage) than they should be secured to the ground with bolts or securely cabled to a ground anchor.

Random pitchforks and wheelbarrows are not the only items susceptible to the gale force winds. Do any buildings lie within the fell-distance of large trees? Are those trees strong and healthy? Have they been trimmed appropriately? It is necessary to look laterally and vertically to assess potential wind hazards. Weak points of buildings, including windows and doors, should be reinforced with plywood covers and/or hurricane protection products in order to best prevent extensive damage from objects uprooted by high winds.

Storm players

The severity of storms and subsequent damage often inhibit staff from reaching the facility. This, in combination with the sensitive temporal aspect of animal care, often necessitates the use of a "storm" or "ride-out" team to ensure continuity of operations. These teams are a select group of employees who often remain on premises throughout the storm and/or are the first to report to the facility during or immediately after a storm. Depending on the size and makeup of the institution, these teams will also consist of animal care, veterinary care, and facilities personnel, specifically electricians and horticulturists/arborists. The key to a good response team is to have team members with extensive background knowledge of many operational areas, and the ability to triage threats and multi-task in response. When it comes to clean up and getting your zoo back up and running it will be everyone "digging in."

Emergency response responsibilities must be outlined in the relevant formal job description (documents maintained by Human Resources outlining a position's specific duties and necessary qualifications/certifications); they do not fall under "Other Duties as Assigned" and staff cannot be solicited to volunteer for such duties. Human Resources and Risk Management/Safety should be consulted when determining the staffing needs of an emergency response, keeping in mind the actions outlined in the institution's COOP. Staff in these designated positions should be further Hazardous Waste Operations and Emergency Response, or "HAZWOPER," trained and certified (see OSHA "Hazardous Waste and Emergency Response," 1910.120).

Taking care of these staff throughout the storm is of utmost importance; their needs and requirements must be added to the list of animal and facility concerns. Ironically, the most frequently forgotten "animals" that must be taken care of during the storm are staff! General first aid kits, specific prescription medications, individually packaged and preserved foods, fresh water sources, and portable generators or batteries to charge communication and medical devices for humans are often afterthoughts, but ultimately the most crucial to ensure continuity of operations. Especially important to remember are portable bathrooms. Flooding and sewer drain issues anywhere will likely impact plumbing everywhere. The toilets in the administration building may be at the highest point in the zoo, but they likely won't flush. Take note and prepare accordingly.

Conclusion

Preparing for storms is daunting; things will always go awry. But do not be fazed. Put a critical eye to every aspect of the COOP. Growth and improvement in emergency response will never come if institutions and their animal care staff accept the status quo. Emergencies and appropriate responses will evolve, institutions will never be able to predict perfectly any and everything that may happen, but they can be prepared - for the sake of the animals and the ethical responsibility it entails, they must.

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ProCare CCU 48: 52 ¼ W x 33 H x 25 D P/N 912-140

ProCare CCU 60: 66 ¼ W x 39 H x 31 ½ D P/N 912-119

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